Contents

Chapter 2
California Water Today

Climates, Ecosystems, and Hydrology

California is a State of contrasts and diversity. The highest (Mount Whitney) and lowest (Death Valley) points in the contiguous United States are located not far from each other. The range of annual rainfall varies greatly from more than 140 inches in the northwestern part of the State to less than 4 inches in the southeastern part (DWR 2003). In roughly north to south order, major geomorphic features are the Klamath Mountains, Modoc Plateau, Cascade Range, Central Valley, Sierra Nevada, Coast Range, Great Basin, Transverse Ranges, Mojave Desert, Peninsular Ranges, and Colorado River Desert.

Figure 2-xx Major geomorphic features of California (under development)

California's Mediterranean climate creates ideal conditions for people to live and work, for crops to grow, and for the unique plants and animals to thrive.

The State's ecosystems, from mountain watersheds to coastal beaches, have been called California's natural infrastructure, supporting its population and economic growth. It also supports an estimated 5,000 native flora species—over one-third of which are found nowhere else on Earth—and 1,000 introduced species. Diverse landforms have preserved unusual species like giant redwoods and made homes for hundreds of species of birds, mammals, and reptiles.

Precipitation varies widely from place to place, from season to season, and from year to year. Most precipitation and runoff occur in the northern part of the State. Climate is dominated by the Pacific storm track. Numerous mountain ranges cause orographic lifting of clouds, producing precipitation mostly on the western slopes and leaving a rain shadow on most eastern slopes. Snowmelt and rain falling in the mountains flow into creeks, streams, and rivers. As flows make their way into the valleys, much of the water percolates into the ground.

Groundwater and surface water are inextricably linked in the hydrologic cycle. The vast majority of California's groundwater that is accessible in significant amounts is stored in alluvial groundwater basins, which cover nearly 40 percent of the geographic area of the State (DWR 2003). Groundwater supplies contribute water used for beneficial purposes. Interbasin storage and transfer projects allow for redistribution of water to where it is needed for crops, people, and industry (Figure 2-xx Map of California with major rivers and facilities).

Figure 2-xx Map of California w/major rivers and facilities

Industry, People, Social Settings

California has the largest and most diverse economy in the nation with a gross product of more than a trillion dollars, 13.5 percent of the U.S. total. The State's rich economic texture is a mix of long-established industries such as agriculture and mineral extraction and emerging industries such as biotechnology, telecommunications, and the Internet. Its multibillion dollar agribusiness makes California the nation's leading agricultural producer. It also has the largest manufacturing complex in the nation and the largest aerospace industry (DOF 2003).

The Gold Rush fostered a technology of water movement that was then used to cultivate California's agricultural landscape. In the early 1900s the technology was employed to urbanize the San Francisco area and the Los Angeles Basin (Starr 2000). With the population boon following World War II, the State's population centers spread, and the suburban, automobile-dependent style of community development became the hallmark of California.

Box 2-xx Historical Perspective of Water Development in California

Since 1990 California's population increased from about 30 million to 36 million, and it is now growing by about 600,000 people per year. The Department of Finance projects that the State's population will reach about 48 million by 2030—an additional 12 million people.[1] California's population will have jumped by more than 20 million people over 50 years to reach a total State population in 2050 of nearly 55 million, according to long-range population projections issued in May 2004 by the California Department of Finance.

The new projections indicate the majority of Californians will continue to reside in Southern California. Los Angeles will remain the largest county in California, exceeding 11 million in 2050. Riverside is projected to overtake Orange County and become the third most populous county behind Los Angeles and San Diego.

In California's Central Valley, San Joaquin County is expected to triple in size and experience the greatest percentage increase over the 50-year period—200 percent. Other counties with large projected percentage increases include Merced, Placer, and Madera (DOF 2004).

[1] The estimates for additional future water demands presented in *Water Plan Update 2004* are based on the period 2000 to 2030, which corresponds to a population increase of 14 million people, from about 34 million to 48 million.

Importance of Water to California's Well-Being

California is the nation's most populous state and the third largest in size. Water planning and management requires full and balanced consideration of the State's richly diverse people, environments, businesses, land uses, climates, geology, and variable hydrology. Diverse and variable water uses are distributed throughout the State and over time, which do not coincide with natural water supplies.

Providing food and fiber crop products to Californians as well as to other states and countries consumes, and will continue to consume, more water than is consumed by all other household uses. California is the top agricultural producer in the nation contributing over half of the nation's fruit, nut, and vegetable production. Many counties rely on agriculture as a primary economic contributor.

Since the 1800s, California has experienced aquatic and riparian habitat degradation and declines in freshwater biodiversity throughout the State. Flows on many rivers and streams currently do not resemble natural hydrographs, which is a contributing factor to impaired ecosystem functions, reduction and loss of native species and habitats, impacts on commercial fisheries, and degraded water quality.

The linkage between water and energy management in California is complex and has both economic and environmental benefits and impacts. Pumping, treating, and distributing water and wastewater consume approximately 10 percent of the state's total electricity. The State Water Project is the largest single user of electricity in the state. The use of fresh water for power plant cooling has increased because of new power plants, placing added pressure on the state's, and in particular local, water supplies. Hydroelectric plants produce about 15 percent of the state's electricity with relatively low production cost, no emissions, and the ability to meet critical peak demands; however, they have changed river flows, stages and temperatures and created barriers to fish passage.

As a result of increased competition among water uses, management of California's water system has become increasingly challenging, complex, and at times contentious. However, water issues are being resolved with leadership from the State and federal governments and partnerships with local and regional stakeholders. Local, regional, State and federal governments and water suppliers each have a role in improving water supply reliability for the existing and future population and the environment.

Water Supply and Management

Today's primary challenge for California water resources management still revolves around how to balance the limited and variable water supplies with the various uses, especially during droughts. In recent decades the reliance on historical water management methods (storage and conveyance) has adapted to include more water conservation and recycling and other water management strategies. Water planners are now considering broader objectives by developing more inclusive, innovative, and diversified plans.

Water quality is inherently linked to water supply and use. Various water management actions such as transfers, water use efficiency, water recycling, conjunctive use of aquifers, storage and conveyance, Delta operations, land fallowing, and hydropower potentially have water quality impacts. Alternatively,

degraded water quality can limit, or make very expensive, some water supply uses or options because the water must be pretreated. Furthermore, water managers are increasingly recognizing that the water quality of various water supplies needs to be matched with its eventual use and its potential treatment.

General Adequacy of Water Supplies and Water Quality

From a statewide perspective, California currently meets most of its water management objectives in most years. Except in multiyear droughts, most urban areas have sufficient supplies for existing populations. However, water supply and quality challenges persist on local and regional scales. Rural residents on small water systems or wells can experience limited water supply during droughts.

- Advances in water conservation and recycling combined with infrastructure improvements including new storage facilities have helped meet most demands despite population growth. Cities use about the same amount of applied water today as they did in the mid-1990s, but accommodate 3.5 million more people. Water conservation and demand reduction strategies are expected to continue playing a prominent role in achieving future goals.

- Most agricultural water demands are met in average water years; however, some growers forego planting and other agricultural operations because they lack a firm water supply. In some areas water historically used for agriculture has been transferred to urban areas, environmental restoration, and groundwater replenishment. Farmers over the past 25 years have learned to grow 50 percent more crops per acre-foot of applied water by improving productivity and efficiency.

- More water is dedicated today to restore ecosystems; however, some environmental requirements and needs are not always met. Although scientific advancement is taking place, we do not fully understand ecosystem needs and their response to flows. Many flow regimes no longer resemble natural hydrographs despite significant efforts to manage water storage and diversions to meet all demands. Water quality is generally good, but many areas face specific water quality problems.

- Some areas of California rely on over-pumping groundwater basins, which reduces available water supply, increases pumping costs, and in some areas degrades groundwater quality. In many areas surface water and groundwater are impaired by natural and human-made contaminants that have effectively reduced the water supply that can be used. These contaminants degrade environmental resources, threaten human health, and increase water treatment costs.

California Water Plan Update 2004 presents a range of actual water supply conditions that have occurred in recent water years. Water year 1998 represents a recent wet year in California. Year 2000 is a representative average water year, and year 2001 provides a snapshot of a drier water year (Table 2-xx California water balance summary).

Table 2-xx California water balance summary (maf)

	1998 (wet year)		2000 (avg year)		2001 (dry year)	
Total supply (precipitation & imports)	336.1		194.6		145.7	
Total uses, outflows & evaporation	330.6		220.7		160.2	
Net storage changes in State	5.5		-6.1		-14.4	
Distribution of dedicated supply (includes reuse) to various applied water uses						
Urban uses	7.7	(8%)	8.8	(11%)	8.6	(13%)
Agricultural uses	27.5	(28%)	34.3	(42%)	33.8	(52%)
Environmental water *	62.1	(64%)	39.4	(47%)	22.4	(35%)
Total dedicated supply	**97.4**		**82.5**		**64.8**	

* Environmental water includes instream flows, wild and scenic flows, required Delta outflow, and managed wetlands water use.

maf = million acre-feet

In average water years like 2000, California receives about 200 million acre-feet of water from precipitation and imports from Colorado, Oregon, and Mexico. Of this total supply, about 50 to 60 percent either is used by native vegetation, evaporates to the atmosphere, provides some of the water for agricultural crops and managed wetlands (effective precipitation), or flows to Oregon, Nevada, the Pacific Ocean, and salt sinks like saline groundwater aquifers and the Salton Sea. The remaining 40 to 50 percent (denoted as dedicated supply) is distributed among urban and agricultural uses, used to protect and restore the environment, or stored in surface and groundwater reservoirs for later use. In any year, some of the dedicated supply includes water that is used multiple times (reuse) and water stored from previous years. Ultimately, about a third of the dedicated supply flows to the Pacific Ocean (in part to meet environmental requirements) or to other salt sinks.

In wet and dry years, like 1998 and 20001, respectively, the total supply and the distribution of the dedicated supply to various uses differ significantly from the example above for an average year. For more information on the State's recent water supplies and uses, see State’s water balance summary in Volume 3 Regional Reports.

Dry-Year Challenges

California has not experienced the hardships and environmental pressures of a prolonged drought since the early 1990s, but we know that similar or worse conditions of unreliable water supplies can and will reoccur. During long or extreme droughts, water supplies are less reliable, and conflicts increase among water users. Water quality is degraded, making it difficult and costly to make it drinkable. Groundwater levels decline, and many rural residents dependent on small water systems or wells run short of water. Business is adversely affected, jeopardizing the economy and irrigated agriculture. Ecosystems are strained, risking sensitive and endangered plants, animals, and habitats.

California's most severe recorded drought occurred in 1976–1977. Two consecutive years with little precipitation (fourth driest and the driest year in the recorded history) left California with record low storage in its surface reservoirs and dangerously low groundwater levels. Socioeconomic and environmental impacts were very severe during these extreme drought conditions. The total loss due to the drought during these two years exceeded $ 2.5 billion ($6.5 billion at today's cost).

The most recent prolonged drought lasted 6 years from 1987 to 1992. During the first 5 years of the drought, the groundwater extractions in San Joaquin Valley exceeded the recharge by 11 million acre-feet, which caused increased land subsidence in some areas. Department of Water Resources (DWR) studies indicate that in 1990–1992 the drought resulted in reduced gross revenues of about $670 million to California agriculture. Energy utilities were forced to substitute hydroelectric power with more costly fossil-fuel generation at an estimated statewide cost of $500 million in 1991. The drought also adversely affected snow-related recreation businesses. Some studies suggest as much as an $85-million loss for snow-related recreation businesses during the winter of 1990–91.

Water managers today use hydrologic records of the past century to estimate how climatic conditions would affect future water availability and water needs. Planners take into account the normal fluctuations of wet and dry years in allocating deliveries from reservoirs and in determining how much water will be provided from other sources.

Several drought contingency planning reports are already published at State and regional levels, some as a result of legislation. In its July 2000 report, "Preparing for California's Next Drought," DWR reviewed items for near-term drought planning, putting California's conditions today into perspective with experiences gained in the 1987–1992 drought. Major findings of the report focused on the characterization of drought conditions as a gradual phenomenon and as a function of impacts on water users. The report also addressed the vulnerability of existing water users based on past droughts and a discussion of current actions that affect drought preparedness planning.

The California Urban Water Management Planning Act requires that each urban water supplier providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually must adopt its urban water management plan at least once every five years. The urban water management plan includes an analysis and a contingency plan for water supply reliability in case of a severe drought, which includes up to 50 percent reduction in water supply. Water management plans lay out shortage contingency scenarios that districts use as guidelines when reducing water use and augmenting short term supply. Long- and short-term conservation measures,

recycling water, water transfers, short-term sources of water, and long-term storage including conjunctive use are some of the tools that water districts use to plan against a multiyear drought.

The passage of SB 672 (Machado, Chapter 320, Statutes of 2001) calls for a description of water management tools and options in the California Water Plan that "will maximize resources and minimize the need to import water from other regions." In contrast to continued reliance on imported water supplies as a primary means of meeting demands, investment in regional water management options can reduce physical and economic risks while providing more regional control over water supplies.

Since the last drought (1987–1992), many notable changes have occurred and would alter the impacts of future droughts. These changes include increases in water demands, changes in regulations, and improvements in infrastructure.

- California's population has increased to about 36 million people as of January 1, 2004.
- The SWRCB adopted Decision 1630 in 1995, which requires higher flows to protect the Delta.
- Completion of construction of Coastal Aqueduct (DWR), Morongo basin pipelines (Mojave Water Agency), Diamond Valley Lake (Metropolitan Water district), Los Vaqueros Reservoir (Contra Costa Water District), and five large-scale groundwater recharge/storage projects should add flexibility in operating the water system.
- Despite the increase in population, advances in water conservation and recycling, combined with infrastructure improvements including new storage facilities, have helped meet most demands. Cities use about the same amount of applied water today as they did in the mid-1990s, but accommodate 3.5 million more people.

The net impact of these changes will result in different responses and effects in different regions of California. Planners must continue to consider these changes while developing drought management plans.

Ongoing Concerns

Some of the specific challenges that will require improved water management include the following.

People without clean and safe drinking water

Census figures from 1990 indicate that in California almost 32,000 housing units obtained their water from shallow wells and another 49,000 housing units obtained their water from some source other than dug wells, drilled wells, or public or private water systems. The Census counted about 68,000 housing units (less than 1 percent of the State's population) that disposed of their sewage by means other than a public sewer, septic tank, or cesspool.

Californians lacking access to clean and safe drinking water are vulnerable to a higher incidence of disease than the general population. Untreated water can contain bacterial, parasitic, and viral contaminates. People at risk most often get their water from untreated surface water such as rivers, lakes, or springs. They may also have shallow unsealed wells or use irrigation ditch water. Surface water and shallow wells can become contaminated from rain runoff or flooding. A further concern is sewage disposal. Many rural communities have problems associated with failing septic drainfields and sewage

surfacing in yards. This lack of wastewater infrastructure may cause cross-contamination with potable water.

Contamination of surface water and groundwater is limiting supplies

As new health risk information is obtained, standards become more stringent to protect health and safety. Meeting existing drinking-water standards continues to be a challenge for water managers due to continually changing source water flows and quality. Population increases result in higher wastewater flows, and many wastewater treatment plants discharge into surface waters that are the drinking-water sources for downstream communities. A wide variety of toxic substances are washed off urban areas in storm water runoff. Industrial discharges can contribute a wide variety of contaminants. A portion of irrigation water, not directly needed by crops, percolates into the soil and is drained away from the root zone naturally or in constructed facilities. This drainage water, which picks up salts and other contaminants from the soil, can create water quality problems for the receiving surface water or groundwater. Agricultural drainage and urban runoff are two of the largest contributors of human-induced contamination of surface water and groundwater in California.

Groundwater overdraft

Overdraft is the condition of a groundwater basin in which the amount of water withdrawn by pumping over the long term exceeds the amount of water that recharges the basin. Overdraft is characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. Overdraft can lead to increased extraction costs, land subsidence, water quality degradation, and environmental impacts. A comprehensive assessment of overdraft in the State's groundwater basins has not been conducted since 1980 (DWR 1980), but it is estimated that overdraft is between 1 million and 2 million acre-feet annually (DWR 2003).

In some cases the term overdraft is used to describe a short-term decline in groundwater in storage during a drought, or to describe a one-year decline of groundwater in storage. During a drought the aquifer is being used as a reservoir, and water is being withdrawn with the expectation that the aquifer will be recharged during a wet season to follow. A one-year decrease of the amount of groundwater in storage is an annual change in storage and does not constitute overdraft.

Box 2-xx Critical Conditions of Overdraft

Global climate change

California's water systems have been designed and operated based on data from a relatively short hydrologic record. Mounting scientific evidence suggests that forecasted climate changes could significantly change California's precipitation pattern and amount from that shown by the record. Less snowpack would mean less natural water storage. More variability in rainfall, wetter at times and drier at times, would place more stress on the reliability of existing flood management and water systems. The high dependence on reservoir storage and snowpack for water supply and flood management make California particularly vulnerable to these types of projected hydrologic changes. (See Chapter 3 Planning for an Uncertain Future and Volume 4 Reference Guide for further discussion on impacts of Global Climate Change.)

Tribal water rights

Tribal water rights for water to meet tribal economic and cultural needs are often encroached upon or unmet. California's water rights framework and federal Reclamation Act policies have evolved over the past 100 years, largely without regard to the water resources reserved for tribal lands. Previous water plan updates did not consider tribal interests or water demands.

Environmental justice

Californians from disadvantaged and under-represented communities continue to face inequities with respect to distribution of clean water, participation in water policy and management decisions, and access to State funding for water projects. All Californians currently do not have equal opportunity or equal access to State planning processes, programs, and funding for water allocation, improving water quality, and determining how to mitigate potential adverse impacts to communities associated with proposed water programs and projects.

Regional/Local Challenges

Following is a summary of challenges faced by various regions. See Volume 3 Regional Reports for a discussion of regions' challenges, a sampling of their management plans, and regional water balance summaries.

Figure 2-xx California's 10 hydrologic regions, the Delta, and Mountain Counties

Box 2-xx Description of California's Hydrologic Regions and Overlay Areas

North Coast Hydrologic Region

Environmental water supply. A primary water management issue in the North Coast Region centers around balancing the water demands of both agriculture and fisheries in the Klamath River Basin. Farmers in the basin have been seeing reductions in water supplies as fishery restoration efforts have been implemented for species such as the Lost River and shortnose suckers, Coho salmon, and steelhead trout. In 1997 National Marine Fisheries Service listed steelhead trout as threatened and in 2002 listed Coho salmon as endangered along part of the Central California coast that includes the Russian River Basin.

Water quality. The Regional Water Quality Control Board's priorities highlight control of nonpoint source runoff from logging, rural roads, agriculture (including grazing), and cities; such runoff causes erosion and sedimentation affecting habitat for spawning and rearing of anadromous fish, or microbial contamination of shellfish (in particular, oyster) growing areas.

Regional groundwater quality problems include seawater intrusion and nitrates in shallow coastal groundwater aquifers, salinity and alkalinity in the lake sediments of the Modoc Plateau basins, and iron, boron, and manganese in the inland basins of Mendocino and Sonoma counties. Septic tank failures in western Sonoma County are a concern for recreation water quality; recreational use of Trinity, Lewiston, and Ruth lakes present concerns of fuel constituents. Abandoned mines, forest herbicide application, and historical discharge of wood treatment chemicals at lumber mills are also regional concerns.

San Francisco Bay Hydrologic Region

Environmental water supply. Environmental water quality issues include the need to control storm water, urban runoff, sediment, and pollutants introduced into the bay and groundwater basins. Serious problems in the San Francisco Bay, its wetlands, and watershed brought about a concerted restoration effort over the last 20 years.

Water supply reliability and water quality. Some of the major challenges facing this region include improving water supply reliability during drought periods and after seismic events and improving drinking water quality. The quality of San Francisco Bay Area drinking water supplies varies by source. Water quality from the Sierra and local surface water and groundwater supplies is generally higher than that of water imported from the Delta.

Central Coast Hydrologic Region

Environmental water supply. Sedimentation poses the greatest water quality threat to Morro Bay, one of 28 estuaries in the National Estuary Program. In its triennial review, the Central Coast Regional Board identified the need to incorporate new microbiological standards for water contact recreation. The main tributary to Monterey Bay, the Salinas River watershed, primarily faces nitrate and pesticide contamination related to agriculture, the valley's main land use.

Water quality. Groundwater overdraft is a problem in the Salinas River watershed. Seawater intrudes up to 6 miles inland in the shallow aquifer around Castroville. The nearby Pajaro River watershed faces a variety of water quality threats such as erosion, urban runoff, sand and gravel mining, flood control projects, off-road vehicles, and historical mercury mining in the Hernandez Lake area.

Beyond the Salinas Valley, water quality problems (salinity, nutrients, etc.) impact other watersheds and groundwater basins in the region

Water supply reliability. With a limited surface water supply and few surface water storage facilities, the region is increasingly depending on groundwater resources.

In 1995 the State Water Resources Control Board (SWRCB) ruled that California-American Water Company, the primary water supplier to most of the Monterey Peninsula, did not have a legal right to about 70 percent of the water it takes from the Carmel River, its main source. Cal-Am has been taking more water from wells that draw from groundwater below the lower valley, keeping as much water as possible in the river. Relatively little is now taken from the river's two reservoirs behind the San Clemente and Los Padres dams.

South Coast Hydrologic Region

Water quality. Colorado River supplies' high levels of total dissolved solids are reduced with State Water Project supplies, but SWP delivery reliability combined with fluctuating TDS levels are a concern. Also of concern is the presence of total organic carbons, bromides, pathogenic microbes, and other contaminates in SWP supplies.

Groundwater management must address salinity and other water quality issues from agricultural and urban uses and seawater intrusion.

Local supplies face water quality problems associated with increased use of recycled water and marginal quality groundwater during droughts.

Water supply reliability. Projected population increase will have a significant impact on water demands. During recent years more than 60 percent of the water used in Southern California has been supplied by the Colorado River. In 2000 California used 20 percent more water from that source than its entitlement, but recent Colorado River agreements will restrict the State to its entitlement of 4.4 million acre-feet of water during average hydrologic years.

Sacramento River Hydrologic Region

Environmental water supply. Ecosystem protection and restoration efforts on tributaries to the Sacramento River as well as the main stem have improved habitat for threatened and endangered species while maintaining water quality in the source area streams that eventually flow into the Bay-Delta. Projects include federal and State partnerships with landowners, agricultural water districts, and Pacific Gas and Electric.

Water quality. Both groundwater and surface water supplies within the region are of high quality, but there are some emerging areas with local groundwater problems. Natural water quality impairments occur throughout the region; for example, at the north end of the Sacramento Valley wells typically have high TDS content; moderate levels of hydrogen sulfide are in groundwater in the volcanic and geothermal areas in the western portion of the region; in the Sierra foothills there is potential for encountering uranium and radon-bearing rock or sulfide mineral deposits containing heavy metals. Some areas have a history of gold mining activities, which may produce increased levels of mercury and other contaminants in surface water supplies. With population growth the system becomes more vulnerable to pollution from urban, industrial, and continued agricultural use.

Water supply reliability and water transfers. During extended periods of drought, surface water allocation cutbacks from the SWP and the Central Valley Project (CVP) limit water districts reliant on these supplies. Users either turn to groundwater or allow prime farmland to lie fallow. With a growing demand for high quality water throughout the State, water transfers are being evaluated more closely as a means to move water out of the Sacramento Valley region to other parts of the State. Several counties within the region have ordinances that regulate or impede water transfers outside of their county.

San Joaquin River Hydrologic Region

Environmental water supply. One of the major challenges facing the region is how to accomplish ecosystem restoration, especially along the San Joaquin River below Friant Dam while maintaining water supply reliability for other purposes. The river's salmon population upstream of the Merced River was eliminated with the construction of Friant Dam in 1944. In 2003, environmental groups led by the Natural Resources Defense Council sued the federal government for renewing long-term contracts with farmers to use water from Friant Dam. Restoring some flow to the San Joaquin River should enhance ecosystem restoration opportunities, but could significantly impact the water supplies for members of the Friant Water Users Authority, as well as the thousands who depend on the water from Friant Dam.

Water quality. Groundwater pumping, a major source of supply in the region, continues to increase in response to growing urban and agricultural demands. Although groundwater quality generally is suitable for most urban and agricultural uses, high TDS content can be found in groundwater along the western edge of the valley floor where the high-saline marine sediments of the Coast Range exist. Agricultural pesticides and herbicides and industrial organic contaminants have also been detected in groundwater samples from the region.

The major surface water quality problems of San Joaquin Valley streams are a result of significant salt loads in agricultural and wetland drainage and runoff as well as the degraded water quality of municipal and industrial wastewater diversions.

Water supply reliability. Proposals to restore fisheries on the San Joaquin River through higher releases of water from Friant Dam have resulted in growing concerns over the long-term availability of the Sierra water supplies.

Tulare Lake Hydrologic Region

Drainage. Significant areas have been experiencing agricultural drainage problems for many years. The poorly drained area is concentrated along the western side of the San Joaquin Valley from Kern County northward into the San Joaquin River region. The drainage water is sometimes contaminated with naturally occurring, but elevated, levels of selenium, boron, and other toxic trace elements that threaten the water quality, environment, and fish and wildlife. In 2002 a U.S. Bureau of Reclamation (USBR) report supported an “in-valley” solution to the drainage problem on the valley’s Westside. Also in 2002 the Westlands Water District and the United States reached a settlement agreement regarding drainage service in the San Luis Unit. The San Joaquin Valley Drainage Authority continues to pursue cost-effective ways to treat and dispose of the drainage water.

Water quality. Much of the groundwater in the western valley floor area is not suitable for use because of its high salinity, resulting from percolation through marine sediments of the western geological formations. Isolated areas of groundwater contain elevated levels of nitrates, sulfates, and some historically used chemicals such as dibromochloropropane used in agriculture and trichloroethylene and dichloroethylene used as solvents.

Water supply reliability. Uncertainty and limitations of supply deliveries from the Delta are exacerbating groundwater overdraft in the region because groundwater is used to replace much of the shortfall in surface water supplies. Land subsidence, an impact of long-term groundwater overdraft, has caused some

damage to canals, utilities, pipelines, and roads. Water transfers within these areas have and will become more common as farmers seek to minimize water supply impacts on their operations. In urban areas water conservation and water recycling programs are being accelerated to help offset short-term water reliability.

North Lahontan Hydrologic Region

Water quality. Water quality in the region is generally very good, but many communities face specific water quality problems. These include groundwater contamination from septic tank discharges in urban subdivision areas such as Susanville and Eagle Lake and MTBE contamination in South Lake Tahoe. The abandoned Leviathan Mine, a federal Superfund site, impacts local creeks with acid mine drainage. The top water quality issues emerging from the Lahontan Regional Water Quality Control Board's 2003 Triennial Review included revising waste discharge prohibition affecting piers in Lake Tahoe and the sodium standards for Carson and Walker rivers and their tributaries. Lake Tahoe is the subject of its own chapter in the region's basin plan.

Water supply reliability. Much of the region is chronically short of water. In the northern portion of the region, drought is a way of life for agriculture; irrigation continues as long as water is available. During dry years areas with little or no storage irrigation may be limited unless surface water is supplemented with groundwater. In Modoc and Lassen counties some groundwater well pumping capacities diminish very rapidly even during the first year of a drought.

While the Truckee River Operating Agreement has the potential to settle 50 years of disputes over Truckee and Carson River waters, the execution and implementation of that agreement will require considerable effort in the coming years. The states of California and Nevada have been participating in a court-ordered confidential mediation that could affect water users in both states. The primary issue of concern is the declining level of Walker Lake in Nevada and the resulting impact on the lake's fishery.

South Lahontan Hydrologic Region

Water quality. Three military installations in the southwestern part of the region are on the federal Superfund National Priorities List because of volatile organic compounds and other hazardous contaminants. The infamous Pacific Gas and Electric chromium groundwater contamination site in Hinkley is also in this region. The Lahontan Regional Water Quality Control Board has identified the need for site-specific ammonia objectives for Paiute Ponds and Amargosa Creek in Los Angeles County.

Water supply reliability. Many parts of the region commonly experience shortfalls in water supplies. Meeting water demands for projected growth and development is a concern for many water agencies. A study by the Antelope Valley Water Group concluded that the valley's existing and future water supply reliability from groundwater, the SWP, Littlerock Reservoir, and recycling is low and that 1998-level water demands would be met only half the time without overdrafting groundwater resources.

Water quality and quantity are inherently related in the Owens River watershed due to the large exports of surface water and groundwater to the City of Los Angeles. Arsenic is a health concern in the basin, and therefore, in Los Angeles as well. When drinking water standards are exceeded, it is most often for TDS, fluoride, or boron.

Colorado River Hydrologic Region

Water quality. The Salton Sea is the primary focus of international water quality issues in this region. The largest sources of the sea's inflow are the New River, which originates in Mexico and is the most polluted river in the United States, the Alamo River, which also originates south of the border and consists mainly of agricultural return flows from the Imperial Valley, and the Imperial Valley agriculture drains, which contribute pesticides, nutrients, selenium, and silt.

The relatively saline Colorado River provides irrigation and domestic water to much of Southern California. Of recent human health concern are the river's low levels of perchlorate, which originates at a site in the Las Vegas Wash and is the nation's largest, and hexavalent chromium at very high levels in wells at Needles near the river. Septic systems at recreational areas along the Colorado River are also a concern for domestic and recreational water uses.

Water supply reliablity. Restoration on the main stem of the Colorado River to protect threatened or endangered fish species may affect reservoir operation and streamflow in the main stem and tributaries. Groundwater overdraft is occurring in the upper (urbanized) and lower (agricultural) part of the Coachella Valley.

Sacramento-San Joaquin Delta

Environmental water supply. Over the past century, the health of the Delta ecosystem has declined in response to a loss of habitat for both aquatic and terrestrial biota. Remaining habitat quality has also declined due to several factors including diversion of water, toxics, and exotic species. Conversion of agricultural land to other uses to accommodate ecosystem improvements or other actions (storage and conveyance) of the California Bay-Delta Program is a major concern to Delta agricultural interests.

Levee stability. Levee construction on the peat soils makes Delta levees vulnerable to failure, especially during earthquakes or floods. But for a yet unknown reason, a levee broke in early June 2004, flooding an estimated 11,000 acres in agriculture. State and federal authorities responded quickly to protect the Delta water source from an intrusion of sea water: The Bureau of Reclamation increased releases of fresh water from Shasta Dam; DWR and Bureau of Reclamation reduced pumping at their South Delta export pumps; Gates of the Delta Cross Channel were opened to move Sacramento River water into the central Delta; and DWR monitored Delta water quality at more than 20 sites and channel velocity changes in the Jones Tract area of the Delta.

Water quality. Salinity and bromide (from saltwater intrusion and from agricultural drainage), organic carbon, and pathogens in Delta water are among the major constituents of concern for drinking water agencies. Population growth leads to increased wastewater discharge and recreational use. Agricultural discharge within the Delta contributes a significant fraction of the organic carbon load to the export pumps.

Water supply reliability. Because the Delta water users divert directly out of the adjacent channels, they normally have immediate access to water, but water quality and channel water levels are influenced by operations of the SWP and CVP, especially water diversions at the south Delta export pumps. Lower water levels in the south Delta make it difficult for existing local irrigation diversions to access the water.

The flow of water to the export pumps can also draw higher salinity into the south Delta from the western Delta.

Mountain Counties

Water quality. Domestic water users in this overlay region generally benefit from high quality water, but this water is often degraded while in transit through the numerous open ditch delivery systems. Drainage from abandoned mines contributes metals and other water quality problems to downstream water bodies. Erosion from natural flooding, logging, and land development, and areas devastated from forest fires, causes sedimentation, and elevated temperatures due to the loss of riparian shade canopy. This is a concern to both domestic water treatment operations and migration and spawning of salmonids in areas not already blocked by water impoundments.

Water supply reliability. The smaller customer base of water systems coupled with previous development of the less costly reservoir sites as well as the topography makes system improvements expensive and interconnections between systems impractical. A limited array of options is available due to the local water users' limited ability to pay and the impossibility of employing groundwater banking and conjunctive use strategies. Many local officials anticipate a reliance on State "Area of Origin and Watershed Protection" law for meeting projected growth and improving water supply reliability.

Water Planning and Programs

In the past century, new water demands were often met at the expense of other environmental or human needs. Today's water management considers a broad range of resource management issues, diverse water demands, and potential water management tools. Moreover, regional and local agencies play an increasingly significant role in water planning. See Box 1-xx Recent Responses to Challenges and further descriptions in Volume 4 Reference Guide.

Box 2-xx Recent Responses to Challenges

Trend from Statewide Solutions to Regional Reliability

In the past 40 years the growing water demands of many areas were met by large State, federal, and inter-regional projects that moved water significant distances across the State. However, new large, interbasin projects on the scale of the SWP and the federal CVP are not foreseeable in the near term due to a variety of issues and uncertainties. While there will be some incremental increases in water supplies from those sources, they will not, by themselves, provide for California's growing population while meeting the State's agriculture production and environmental objectives.

Recent history has taught water managers that even though imported supplies will continue to be important, they cannot be relied on to satisfy growing water demands. In the 1980s concerns for protecting the environment were manifested in strong new laws and regulations. These regulations affected the ability of imported water projects to deliver water. The resulting uncertainty also contributed to hesitancy to invest in additional facilities for these interbasin systems and forced water agencies to face difficult decisions about how to provide adequate water supply reliability. These agencies increasingly

began looking more intensely at local water management options such as water conservation measures or groundwater storage. Water managers also began to learn that sustainable water planning must address multiple objectives and consider broad needs.

Throughout California stakeholders are beginning to work together within regions and watersheds to develop programs that include multiple jurisdictions and provide multiple resource benefits.

Regional Water Management

Out of this experience grew the notion of regional water management, which is offering opportunities that may not be available to individual water suppliers: reduced dependence on imported water and increased reliance on local supplies, enhanced utilization of groundwater with improved ability to limit groundwater overdraft, increased supply reliability, security, and improved water quality. The extent to which regions are taking advantage of these opportunities is driven by considerations such as economic, environmental, engineering, and institutional feasibility.

Regional efforts are beginning to meet a wide range of objectives tailored to local goals by integrating a diverse set of water and resource management activities. More is being done to meet water demands with water conservation, reoperation of facilities, water recycling, groundwater storage and management, transfer programs, and in limited cases regional or local surface storage reservoirs. Overall, this increased focus on regional planning results in solutions that solve water management problems more efficiently, consider other resource issues, and enjoy broader public support. See Box 2-xx Examples of Ongoing Regional Water Planning Efforts.

Box 2-xx Examples of Ongoing Regional Water Planning Efforts (listed north to south)

Integrated Resource Planning

Today, California is placing more emphasis on regional water management that is based on integrated resource planning because it:

- makes better use of existing local resources,
- provides for coordination and improved efficiency and flexibility in the actions of local agencies and governments within a region,
- integrates all aspects of water management, including water quality, local surface water, groundwater, recycled water, imported supplies, conveyance, conservation and ecosystem restoration, and
- reflects regional diversity and values in setting management objectives.

Integrated resource planning is a process for determining the appropriate mix of demand management and supply augmentation options that provide long-term, reliable water supply at lowest reasonable cost and with highest possible benefits to customers, economic development, environmental quality, and other societal objectives (see Box 2-xx More Information on Integrated Resource Planning).

Box 2-xx More Information on Integrated Resource Planning (Internet links)

As with most water planning processes, integrated resource planning objectives include developing cost-effective, environmentally sensitive plans. The integrated plans address multiple water and related resource objectives to produce multiple benefits. As an example, in some areas of the State where it is feasible, agricultural users are developing water use efficiency projects that simultaneously help stretch limited water supplies, reduce loads of contaminants, preserve the agricultural economy, and improve aquatic habitat. Similarly some urban areas are looking at multipurpose projects that use storm water for groundwater recharge thereby increasing water supply, reducing urban runoff, improving water quality, and decreasing costs for drainage facilities. Although they may not be making significant contributions to urban water supply reliability, these types of projects produce a diverse and valuable mix of other benefits.

No one type of regional water planning is suited for all areas, and some regions may have more than one type of integrated resource planning. Some efforts are conducting integrated resource planning on a watershed basis that generally focuses on improving significant functions and processes of a watershed. There are many overlapping characteristics and issues that confront watershed management and integrated water resource management. Both approaches combine local, State, and federal resources with the intent to create a broader, more flexible management system. See Box-2-xx Watershed Management and Volume 2 Resource Management Strategies for a description of watershed management in California.

Box 2-xx Watershed Management

The California Legislature has produced several regulations to improve water management and integrated planning at the local level. Recent legislation has also encouraged improvements in recycling, desalination, and groundwater potential (see Box 2-xx New Laws Support Regional Water Planning and Management). These statutory changes provide a framework for pursuing regional water management and reflect the goals of managing water supplies with more flexibility while addressing a broad array of benefits and interests. For example, Water Code Section 10530 et seq. (SB 1672 Statutes of 2002, Chapter 767 and AB 2469 Statutes of 2002, Chapter 949) provide for integrated regional water management plans and specify that a planning group developing these plans be comprised of at least 3 local agencies, 2 of which must have statutory authority over water supply. The emphasis in this part of the Water Code is on creating greater flexibility in managing supplies while potentially addressing other water issues such as flood management, wastewater treatment, and ecosystem health.

Box 2-xx New Laws Support Regional Water Planning and Management

Coordination of Water and Land Use Planning

Three bills enacted by the Legislature to improve the coordination between water supply and land use planning processes at the local level became effective January 1, 2002 (see Box 2-xx SB221, SB610, and AB901). In general, the new laws are intended to improve the assessment of water supplies during the local planning process before approval of land use projects that depend on water. The new laws require verification of sufficient water supplies as a condition for approving developments, and they compel urban water suppliers to provide more information on groundwater reliability if used as a supply. Normal and drought year conditions are specified in the law when evaluating water supply reliability.

Box 2-xx SB221, SB610, and AB901

Statewide and Inter-Regional Response

Programs and Planning

CALFED Bay-Delta Program's Record of Decision Stage 1 Actions. The four primary objectives of the CALFED program are the overall objectives for each of the key program areas of water quality, ecosystem quality, water supply, and vulnerability of Delta functions. Secondary objectives within each of these areas tie back to the primary objectives and back through the mission statement itself:

- Provide good water quality for all beneficial uses;
- Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species;
- Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system;
- Reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees.

Six years after signing the Bay-Delta Accord and subsequent planning and public input, the CALFED Bay-Delta Program signed its Record of Decision in August 2000 and began implementation to meet its objectives. Through 2003 CALFED has invested nearly $2 billion in water supply, water quality, and ecosystem restoration programs; significantly reduced conflicts over Delta operations through better agency coordination and the new Environmental Water Account; and launched an independent science program, which brings national experts together to conduct workshops and reviews of all major program activities. The California legislature established the California Bay-Delta Authority as a new governance structure to oversee the Program and the CALFED agencies.

Colorado River Agreement. In legislation enacted in 2003 to implement the Colorado River Quantification Settlement Agreement, the State of California accepted significant responsibilities and liabilities for mitigation of the agreement's environmental impacts and for Salton Sea ecosystem restoration. The State's actions were to enable the QSA's local agency signatories to reach agreement on how to reduce their use of Colorado River water to California's basic interstate apportionment of 4.4 million acre-feet annually. Included in the QSA are water transfers—from Imperial Irrigation District to San Diego County Water Authority and to Coachella Valley Water District—that will reduce the inflows of agricultural runoff that constitute the sea's chief source of fresh water. The sea's present

salinity of about 44,000 mg/l is some 25 percent saltier than seawater. As the sea's salinity increases through evaporation and concentration of salts, it will become too saline to support its present fish and wildlife resources.

The QSA implementing legislation is contained in three bills chaptered in 2003—SB 277 (Ducheny), SB 317 (Kuehl), and SB 654 (Machado).

Sacramento and San Joaquin River Basins Comprehensive Study. State and federal legislation authorized the development of comprehensive plans for flood damage reduction and ecosystem restoration along the Sacramento and San Joaquin rivers following the disastrous floods that occurred in January 1997. Although there is widespread agreement that changes are needed to improve the system, there is no agreement at this time where the various measures should take place. What did evolve from these planning efforts is a process to develop future projects to meet the system's comprehensive public safety, flood damage reduction and ecosystem restoration objectives. This process consists of guiding principles for integrating flood damage reduction and ecosystem restoration in future changes to the flood management system. The process provides an approach to develop projects that ensures system-wide effects are evaluated regardless of project scale and an administrative structure to oversee consistent application of the process.

The December 2002 interim report (USACE) recognizes the water supply conveyance benefits of the levee system and suggests that a broader responsibility for maintenance of the flood management system should be considered. The Reclamation Board of the State of California endorsed the interim report on December 20, 2002.

As a result of the comprehensive study, a draft feasibility study/EIS/EIR has been prepared for the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project located about 85 miles north of Sacramento on the Sacramanto River. This study proposes replacing the existing "J" levee with a new setback levee that will protect the Hamilton City community of about 2,000 people plus surrounding agricultural lands while restoring about 1,500 acres of native vegetation along the Sacramento River.

Klamath Basin. Since the drought of 2001, many Klamath Basin farmers have switched to groundwater as a source of water supply for their crops, which has been encouraged by USBR financial support. The state of Oregon has issued more than 130 new permits for well construction in the Klamath Basin, yet very little is known about the capacity and recharge capability of this underground supply source. In 2004 it has been reported that groundwater levels are now declining—in some areas by as much as 20 feet. This has raised new concerns about the adequacy of the groundwater basin, and the state of Oregon is now working with the U.S. Geological Survey (USGS) and the State of California to evaluate and report on the capabilities of this interstate groundwater system.

In March 2002 the federal administration established a cabinet-level Klamath River Basin Federal Working Group that includes the departments of Interior, Agriculture, and Commerce to address concerns raised by farmers, ranchers, fishermen, tribes, and others affected by the difficult conditions in Klamath. As part of the working group, the U.S. Department of Agriculture is working with farmers and ranchers to implement a variety of conservation programs that are available through the department.

For example, the Natural Resources Conservation Service is working with a number of landowners to improve wetland and wildlife habitat through the Wetlands Reserve Program. This includes an additional 2,500 acres enrolled in permanent easements during 2002. The projects are on Upper Klamath Lake and the Williamson River, both major water sources of the Klamath Basin. These projects will benefit water quality and improve wildlife habitat, thereby providing benefits to the endangered Lost River and Shortnose Sucker fish. (DOI 2003)

Trinity River Basin. In the Trinity River Basin significant change in use of the region's water was approved by the Secretary of the Interior in December 2000. As part of an effort to restore Trinity River fisheries, Trinity River instream flows were increased from 340,000 acre-feet per year (roughly one quarter of average annual flow at the CVP diversion point on the Trinity River) to an average of 595,000 acre-feet per year. This decision, which would reduce the amount of water available for export from the Trinity River to the Central Valley, is currently the subject of litigation in the federal courts. Efforts are continuing to try to achieve an acceptable water operations plan that will improve the Trinity River fishery, and also allow continued water exports into the Central Valley to meet the needs of the CVP system.

Truckee River Basin. In the interstate Truckee River Basin, which includes Lake Tahoe, efforts continue to resolve years of disputes over the waters of the Truckee and Carson rivers. In 1990 Congress passed the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Public Law 101-618), which makes an interstate allocation of the waters between California and Nevada, provides for the settlement of certain Native American rights claims, and provides for water supplies for specified environmental purposes in Nevada. California's water entitlements under this act will be established as 23,000 acre-feet annually in the Lake Tahoe Basin and 32,000 acre-feet annually in the Truckee River Basin below Lake Tahoe; with the remainder of the basin water supply assigned to water interests in Nevada. However, provisions of the Settlement Act, including the interstate water allocation, will not take effect until several conditions are met, which include negotiation and approval of a new Truckee River Operation Agreement.

Negotiation of a proposed Truckee River Operating Agreement (TROA) and preparation of an EIR/EIS for the TROA began in 1991 involving the federal government, the states of California and Nevada, the Pyramid Lake Paiute Indian Tribe, and water purveyors from both states. The revised draft EIR/EIS for this agreement is scheduled for public distribution in 2004. When executed, the TROA would establish river operations procedures to meet water rights on the Truckee River and to enhance spawning flows in the lower Truckee River for cui-ui and Lahontan cutthroat trout. TROA would provide for management of water within the Truckee River Basin in California, including instream flow requirements and reservoir storage for fishery and recreation uses, and would include procedures for operation and accounting of surface and groundwater diversions in California's part of the Truckee Basin.

Programs to manage Lake Tahoe water quality by regulating development and preventing pollutants from reaching the lake are being implemented at the federal, State, and local levels. The Tahoe Regional Planning Agency, a bistate agency created by Congress, sets regional environmental standards, issues land use permits (including conditions to protect water quality), and takes enforcement actions throughout the basin. TRPA's regional plan provides for achievements and maintenance of environmental targets by managing growth and development. In addition to its regulatory activities, TRPA carries out a capital improvement program to repair environmental damage done before its regional plan was adopted.

Mono Lake and Owens River. In the Mono Lake and Owens River basins, extensive long-term water diversions through the Los Angeles Aqueduct to Southern California have negatively affected the region for decades. In 1993 after years of litigation the Los Angeles Department of Water and Power (LADWP) began final flow releases to restore Mono Lake to previous levels, with a desired water surface elevation of 6,392 feet. Under this restoration program Mono Lake's surface elevation has been rising and reached an elevation of 6,382 feet by year 2003.

In December of 2003, the LADWP and the City of Los Angeles approved a tentative agreement with several Owens Valley interest groups called the Lower Owens River Project (LORP) that will return water to a 62-mile stretch of the lower Owens River to restore the riparian ecosystem. After modifications to existing diversion structures are completed, this program is expected to start operations in the fall of 2005 with a base flow of 40 cubic feet per second. If successful, LORP has the potential to become one of the most significant river restoration projects undertaken in the United States.

Task Forces and Advisory Panels

California Floodplain Management Task Force. This task force was established in early 2002 to examine specific issues related to State and local floodplain management. The diverse group of private, nonprofit, and local interest groups and State, federal, and local agencies created more than 30 recommendations for improved floodplain management. (See Volume 2 Resource Management Strategies, for key recommendations).

Desalination Task Force. Assembly Bill 2717 called for DWR to establish a Desalination Task Force. In 2004 the task force will report to the Legislature on potential opportunities for desalination of seawater and brackish water in California, impediments to using desalination technology, and what role, if any, the State should play in furthering the use of desalination. (See Volume 2 Resource Management Strategies, for key recommendations.)

The Governor's Advisory Drought Planning Panel. This panel was formed in 2000 to develop a contingency plan to address the impacts of critical water shortages with the recognition that health, welfare, and economy of California are among those severely impacted. As part of a five-year planning program to implement specific actions of the CALFED Bay-Delta Program, the panel made recommendations for actions that State government could take (December 2000 report, "The Critical Water Shortages Contingency Plan"). The recommendations included a critical water shortage reduction marketing program to facilitate intraregional, short-term, and dry-year transfers, financial and planning assistance to local agencies for drought-related response activities, and assistance to small water systems and homeowners in rural counties. The work on these programs started early 2002 and is ongoing through bond measures Proposition 13 (March 2000) and Proposition 50 (November 2002). (See Volume 4 Reference Guide for panel's recommendations.)

California Commission on Building for the 21st Century. The commission was directed to "study the building and infrastructure needs of California, with the intent of identifying existing critical infrastructure needs and developing a comprehensive long-term capital investment plan for financing public building needs, including responsible financial approaches and efficiency improvements." In 2000 at the recommendation of this Commission and with the support of the Governor and the Legislature, more than $4 billion in parks and water bonds were placed on the ballot (propositions 12 and 13) and

approved, constituting the largest such State investment in the nation's history (California Commission on Building for the 21st Century 2001).

State Recycling Task Force. The task force is charged with evaluating the current framework of State and local rules, regulations, ordinances, and permits to identify the opportunities, obstacles, or disincentives to maximizing the safe use of recycled water. (See Volume 2 Resource Management Strategies, for key recommendations.)

State Watershed Management Guidelines and Initiative. Assembly Bill 2117 (Wayne, Chapter 735, Statutes of 2000) required a report to the Legislature on California's watershed status and any needed changes in State laws. The State Secretary for Resources and Chair of the SWRCB formed the Joint Task Force on California Watershed Management, an interagency and stakeholder effort, to discuss the results of the 10 case studies, to refine the findings, and to craft major recommendations to move the State in a new direction to protect and restore watersheds, lakes, rivers, and estuaries in California. The task force issued its recommendations in an April 2002 report, "Addressing the Need to Protect California's Watersheds: Working with Local Partnerships."

State Bulletins and Reports

California's Groundwater Update 2003 (Bulletin 118). DWR has long recognized the need for collection, summary, and evaluation of groundwater data as tools in planning optimal use of the groundwater resource. Bulletin 118 presents the results of groundwater basin evaluations in California.

Fish Passage Improvement Program. A part of the CALFED Ecosystem Restoration Program, the Fish Passage Improvement Program is a partnership-building effort to improve and enhance fish passage in Central Valley and Bay Area rivers and streams, working with local, state, and federal agencies and stakeholders to plan and implement projects to remove barriers that impede migration and spawning of anadromous fish. The inaugural issue of Bulletin 250 (DWR 2003) presented for the first time aggregated information on fish passage impediments and activities to address the decline in riverine habitat within the Fish Passage Improvement Program geographic scope.

General Plan Guidelines Recommend New Water Element. The State of California General Plan Guidelines, updated in 2002, recommend that an integrated water management element be included as an optional element in each general plan. Several jurisdictions have developed, or are now preparing, water management elements and chapters for their general plans.

Governor's Environmental Goals and Policy Report Update. State statute requires that the Governor prepare a comprehensive Environmental Goals and Policy Report (EGPR) to provide a long-range (20–30 year) overview of State growth and development. The report must describe approved State environmental goals and objectives, including those directed to land use, population growth and distribution, development, conservation of natural resources, and air and water quality. In addition the report must describe new and revised State policies, programs, and other actions the executive and legislative branches required to implement the approved goals. All other State plans, including *California Water Plan*, must be consistent with the EGPR by 2005. A draft EGPR update was prepared in 2003. The Governor's Office of Planning and Research is required to report to the Governor and Legislature by January 1, 2005, regarding implementation of the EGPR.

Management of the California State Water Project. Bulletin 132 is a series of annual reports that began in 1963 and describe the status of SWP operations and water deliveries. The most recent issue is Bulletin 132-02, which covers the period from January 1, 2001, to December 31, 2001 (DWR 2004). The annual report updates information regarding project costs and financing, water supply planning, power operations, and significant events that affect the management of the SWP. Bulletin 132-02 also discusses the continuation of construction of the East Branch Extension, Delta resources and environmental issues, including the CALFED Bay-Delta Program; Oroville facilities relicensing; financial analysis of the SWP; and the update of business systems in the Department.

Water Bonds

Voters have approved three additional major California water bonds since the last Water Plan Update:

- Proposition 13. $1.97 billion in bonds to support safe drinking, water quality, flood protection, and water reliability projects throughout the State.
- Proposition 40. A $2.6 billion in bonds for conservation, neighborhood parks, and coastline and watershed protection.
- Proposition 50. A $3.4 billion bond that provides $825 million in funding for CALFED for a variety of programs.

AB 303 (Local Groundwater Management Assistance Act of 2000). The intent of Assembly Bill 303 is to provide grant funding to help local agencies conduct groundwater studies or carry out groundwater monitoring and management activities, including the development of groundwater management plans. The maximum grant available is $250,000.

Federal Planning (Water 2025)

Water 2025: Preventing Crises and Conflict in the West calls for concentrating existing federal financial and technical resources in key western watersheds and in critical research and development such as water conservation and desalinization that will help to predict, prevent, and alleviate water supply conflicts. Water 2025 proposes that modernizing aging water supply structures (from dams and reservoirs to pumping stations, pipelines, and canals), improved regional water planning, and tools could help stretch existing water supplies by improving conservation, using more efficiencies, and better monitoring water resources.

A primary principle of Water 2025 is that solutions to complex water supply issues must recognize and respect state, tribal, and federal water rights, contracts, and interstate compacts and decrees of the United States Supreme Court that allocate the right to use water. (see Box 2-xx Water 2025 (Federal) Principles, Realities, and Key Tools).

Box 2-xx Water 2025 (Federal) Principles, Realities, and Key Tools

Institutional Setting

California has a very large and complex water system with a highly decentralized system of governance involving State and federal agencies, thousands of local agencies, governments, and private firms, and millions of households and farms. This decentralization has a major influence on daily management, planning, and policy making. Competing and conflicting roles and responsibilities make it difficult to integrate regional water management. Differing roles of the various State, federal, and local governments during planning can create coordination difficulties. The organizational structure of State government has led to insufficient communication, coordination, and cooperation among numerous State agencies and departments responsible for water.

Current Roles

California Government

Many State departments and agencies oversee California's water resources. DWR operates the State Water Project and is responsible for overall water planning. The SWRCB integrates water rights and water quality decision-making authority. The SWRCB and the nine Regional Water Quality Control Boards are responsible for protecting California's water resources. Pursuant to the Porter-Cologne Water Quality Control Act, water quality control plans for each of the nine regions shall become part of the California Water Plan. Other State agency and their roles in water management follow:

- Department of Health Services—Oversees State program – Oversees programs to protect and improve the health of all Californians—Regulate and permit drinking water
- Department of Fish and Game—Regulates and conserves the State's wildlife
- Reclamation Board—Plans and controls flooding along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with the U.S. Army Corps of Engineers
- Department of Food and Agriculture—Supports California's agricultural economy
- California Environmental Protection Agency—Restores, protects and enhances the environment, to ensure public health, environmental quality and economic vitality
- Delta Protection Commission—Responsible for preparation of a regional plan for the "heart" of the Delta
- Colorado River Board—Protects California's rights and interests in the resources provided by the Colorado River
- California Bay-Delta Authority—Develops and implements a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the in the Bay-Delta
- Department of Pesticide Regulation—Regulates pesticide sales and use and promotes reduced-risk pest management; plays a significant role in monitoring for the presence of pesticides and in preventing further contamination of the water resource.
- Department of Toxic Substances Control—Provides technical oversight for the characterization and remediation of soil and water contamination.
- California Integrated Waste Management Board—Promotes a zero waste California in partnership with local government, industry, and the public. This means managing the estimated 76 million tons of waste generated each year by reducing waste whenever possible, promoting the management of all materials to their highest and best use, and protecting public health and safety and the environment.

Federal government

The USBR operates the CVP, the largest water project in California. The U.S. Environmental Protection Agency, Fish and Wildlife Service, and others play important roles in the regulation and management of California's water resources:

- USBR—federal water supply projects
- U.S. Environmental Protection Agency—protects human health, safeguarding the natural environment
- Fish and Wildlife Service—conserves, protects, and enhances fish, wildlife, and plants and their habitats
- USGS—water measurement and water quality research
- National Marine Fisheries Service (NOAA Fisheries)—protects and preserves living marine resources, including anadromous fish
- Bureau of Land Management—manages federal lands
- National Park Service—manages national parks, including their watersheds
- U.S. Department of Agriculture—manages forests, watersheds, and other natural resources
- U.S. Army Corps of Engineers—flood management and wetlands permits
- Western Area Power Administration—manages power generated by the CVP

The State and federal governments are responsible for representing and protecting the public trust (certain types of property of high public value held for the benefit of all citizens). Together, the State and federal governments provide assistance and guidance to local governments (city- and county-owned municipal water systems, etc.), Native American tribes, and special districts.

Native American Tribes

American Indian tribes exist under a unique relationship with the federal government as that of a beneficiary and trustee, respectively. In a broad sense, the federal government has a fiduciary responsibility to Indian tribes; however, the execution and effectiveness of this responsibility differs between the three branches of the federal government.

When reservation lands were set aside, the natural resources of the reservations also were reserved for tribal people. The federal government is legal titleholder to all trust resources. Native American tribes operate in their government-to-government relationship with federal agencies and help plan water resource projects affecting tribal land. Several landmark decisions have defined legal principles for intergovernmental relationships and tribal rights. In California and elsewhere tribes without federal recognition do not enjoy governmental status or benefits. Tribal water rights are discussed in the following section, "Understanding How Water Is Allocated, Used, and Regulated."

Reversing a long trend of administrative and economic failures in the administration of the government's trust relationship with tribes, in 1970 President Richard Nixon issued a statement in support of strengthening Indian tribal governments and improving the trust relationship. The federal government has initiated programs to encourage development of Indian resources and tribal self-determination.

Public agencies, districts, and local governments

Local city and county governments and about 3,500 special districts have ultimate responsibility for providing safe and reliable water to their customers. In general, there are two methods in California for forming special districts that develop, control, or distribute water: enactment of a general act under which the districts may be formed as set forth in the act, and enactment of a special act creating the district and prescribing its powers. Cities and counties are the land management and planning entities as well as resource management agencies, which most influence the location and amount of population growth within the State. Many counties have adopted ordinances that require permits for certain uses of groundwater within their boundaries.

Private entities

In addition to public agencies, there are private entities that may provide water supply. Mutual water companies, for example, are private corporations that perform water supply and distribution functions similar to public water districts. Investor-owned utilities are also involved in water supply activities, sometimes as an adjunct of hydroelectric power development. These investor-owned water companies are regulated by the State's Public Utilities Commission.

International trade agreements

Since January 2000 more than 140 World Trade Organization member governments have been negotiating to further liberalize the global services market. The General Agreement on Trade in Services is among WTO's most important agreements. It is a set of multilateral rules covering international trade in services. GATS specifically recognizes "the right of Members to regulate, and to introduce new regulations, on the supply of services … in order to meet national policy objectives". No international trade treaty now in effect or being negotiated by the United States would prevent local, state, or federal government agencies from reviewing and regulating water projects that involve private companies with multinational ties. Such projects include desalination plants, water transfers, water storage projects (both above and below ground), and wastewater reclamation projects. So long as government regulations are applied in the same manner to water projects involving multinational corporations as they are to water projects owned or operated by domestic companies or public utilities, there would be no conflict with international trade treaties.

Individual water users

Collectively, the millions of urban businesses, individual households, and farms fund the operation and maintenance of California's water systems through payment of taxes and water bills. Each makes decisions on water use and conservation for its own circumstances. After each water use, individual water users must dispose of the used water, usually through a sewer or gutter, which in turn can create water pollution. During drought periods, many households modify outdoor watering to conserve water. Each year, farmers make decisions on planting and water application based on weather conditions, forecasted water supply, and individual tolerance for market risk. Taken together, these individual decisions about water use have an enormous impact on both water demand and water quality and present many opportunities for individuals to play positive roles in better managing California's water quantity and quality.

Institutional tools for managing resources

In many cases, several institutional tools interact in managing resources:

- Collaborative decision-making—Often, a decision made through collaboration can avoid the need for new legislation, regulation, and litigation.
- Education—Educational programs are often the least expensive way to influence public action. Information on water use efficiency practices, water costs, habitat conditions and other important subjects can help the public become active participants in plan implementation.
- Legislation—Legislation can provide new statutes for managing resources.
- Voter-approved propositions—Voters can directly enact new laws by approving propositions. In many cases, voters decide on major funding requests. Since 1996, voters have approved four major California water bonds (propositions 204, 13, 40, and 50).
- Regulation—State regulatory agencies adopt regulations (rules) to implement, interpret, or make specific the law enforced or administered by it, or to govern its procedure.
- Litigation—Lawsuits provide a dispute-resolution tool that most, if not all, water stakeholders will employ when it appears to be their best alternative. These judicial proceedings can provide greater certainty to water rights holders and to public trust values in California in ways that the collaborative process may fail to accomplish. Legal precedents create a framework for setting up water resource management programs, but do not themselves create or implement the programs. (See Box 2-xx Recent Litigation in California Water Management.)

Box 2-xx Recent Litigation in California Water Management

Understanding How Water Is Allocated, Used and Regulated

In California, water use and supplies are controlled and managed under an intricate system of common law principles, constitutional provisions, State and federal statutes, court decisions, and contracts or agreements. All of these components constitute the institutional framework for the protection of public interests and their balance with private claims in California's water allocation and management. (See Box 2-xx Some Regulations Governing Water-related Resources Management and more details in Volume 4 Reference Guide.)

Box 2-xx Some Regulations Governing Water-related Resources Management

Constitutional, statutory and common law framework for water uses

The people of California own all the water in the State. Water rights in California are subject to State constitutional prohibition of wasteful or unreasonable use. California's water law and policy requires that "water resources of the State be put to beneficial use to the fullest extent of which they are capable" (Article X, Section 2 of the California Constitution). It places a significant limitation on water rights by prohibiting the waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water.

Public Trust Doctrine

Rights to use water are also subject to the State's obligation under the Public Trust Doctrine as trustee of certain resources for Californians. The Public Trust Doctrine is a legal doctrine that imposes responsibilities on State agencies to protect trust resources associated with California's waterways, such as navigation, fisheries, recreation, ecological preservation, and related beneficial uses. In *National Audubon Society v. Superior Court of Alpine County*, the California Supreme Court concluded that the public trust is an affirmation of the duty of the State to protect the people's common heritage of streams, lakes, marshlands, and tidelands, surrendering such protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust. Thus, California agencies have fiduciary obligations to the public when they make decisions affecting trust assets.

In *National Audubon*, the court addressed the relationship between the Public Trust Doctrine and California's water rights system, and integrated them. The Court reached three major conclusions:

1. The State retains continuing supervisory control over its navigable waters, the lands beneath them, and the flows of their tributary streams. This prevents any party from acquiring a vested right to appropriate water in a manner harmful to the uses protected by the public trust. The SWRCB may reconsider past water allocation decisions in light of current knowledge and current needs.
2. As a practical matter, it will be necessary for the State to grant usufructuary licenses to allow appropriation of water for uses outside the stream, even though this taking may unavoidably harm the trust uses of the source stream.
3. "The State has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible."

Thus, while the State may, as a matter of practical necessity, have to approve appropriations that will cause harm to trust uses, it "must at all times bear in mind its duty as trustee to consider the effect of such taking on the public trust, (cite omitted) and to preserve, so far as consistent with the public interest, the uses protected by the trust."

Surface water rights

California's system for surface water rights recognizes both riparian rights and appropriative rights. Riparian rights were adopted in California as a part of the English common law when California became a state in 1850. At that time, gold miners were already operating under their own system that recognized claims to water rights based on prior appropriation.

- Riparian. A riparian right is the right to divert, but not store, a portion of the natural flow for use based on the ownership of property adjacent to a natural watercourse. Water claimed through a riparian right must be used on the riparian parcel. Such a right is generally attached to the riparian parcel of land except where a riparian right has been preserved for noncontiguous parcels when land is subdivided. Generally, riparian rights are not lost through non-use. All riparian water users have the same priority; senior and junior riparian water rights do not exist. During times of water shortage, all riparian water users must adjust their water use to allow equal sharing of the available water supply.

- Appropriative. Under the prior appropriation doctrine, a person may acquire a right to divert, store, and use water regardless of whether the land on which it is used is adjacent to a stream or within its

watershed. When water in a stream is over-appropriated, a priority system determines which appropriators may divert water. The rule of priority between appropriators is "first in time is first in right." A senior appropriative water rights holder may not change an established use of the water to the detriment of a junior, including a junior's reliance on a senior's return flow. Acquisition of appropriative water rights is subject to the issuance of a permit by the SWRCB with priority based on the date a permit is issued. Permit and license provisions do not apply to pre-1914 appropriative rights (those initiated before the Water Commission Act took effect in 1914), but pre-1914 rights are still subject to reasonable and beneficial use. Appropriative rights may be sold or transferred.

Groundwater use and management

California does not regulate the extraction and appropriation of groundwater with the exception of the 19 adjudicated groundwater basins and basins in which a local agency has obtained statutory authority to manage groundwater. Any overlying landowner in California has the right to build a well and extract groundwater as long as that groundwater is put to a reasonable and beneficial use. In 1903, the California Supreme Court rejected the English common law system of absolute ownership of groundwater, which allowed for unregulated pumping of groundwater. Instead the court adopted the rule of "reasonable use of percolating waters." This established the doctrine of "correlative rights and reasonable use" under which every landowner in the basin has a right to extract and use groundwater and that right is correlative with the rights of all the overlying landowners in the basin. Those correlative rights are not quantified until the basin is adjudicated. An overlying landowner's right is considered to be analogous to a riparian right to surface water. Groundwater can be appropriated-use on non-overlying lands if water is surplus to the reasonable needs of overlying owners. The *Baldwin v. Tehama* decision affirmed the authority of counties to regulate groundwater resources within their boundaries. Many local agencies and governments have prepared groundwater basin management plans under AB 3030.

Tribal water rights

Some Indian reservations and other federal lands have reserved water rights implied from acts of the federal government, rather than State law. When tribal lands were reserved, their natural resources were implicitly reserved for tribal use. Because reserved tribal rights were generally not created by state law, states' water allocations did not account for tribal resources. In the landmark *Winters v. U.S.* case in 1908, the U.S. Supreme court established that sufficient water was reserved to fulfill the uses of a reservation at the time the reservation was established. The decision, however, did not indicate a method for quantifying tribal water rights. Winters rights also retain their validity and seniority over State appropriated water whether or not the tribes have put the water to beneficial use. Only after many years did tribes begin to assert and develop their reserved water rights. In 1963 the U.S. Supreme Court decision Arizona v. California reaffirmed Winters and established a quantification standard based on irrigation, presupposing that tribes would pursue agriculture. Despite criticisms of the "practicably irrigable acreage" (PIA) quantification standard from various perspectives, the PIA standard provided certainty to future water development. Quantifying water needs in terms of agricultural potential does not accurately show the many other needs for water. Even urban water quantity and quality assessments that look at the adequacy of the domestic water supply and sanitation do not provide a complete picture of tribal water needs. A large part of the tribal water needs are for instream flows and other water bodies that support environmental and cultural needs for fishing, hunting, and trapping.

The 1902 Reclamation Act provided for the establishment of irrigated agriculture and settlement throughout the Western states. Historical perspective indicates this policy was pursued generally without regard to Indian water rights or the 1908 Winters decision. In 1952, Congress passed the McCarran Amendment which waived sovereign immunity and authorized the adjudication of federal water rights in stream adjudications brought in state courts. The court later ruled that state adjudications may also apply to Indian reserved water rights held in trust by the United States. In asserting their Winters rights, tribes have come into conflict with water-using development that grew out of substantial federal and private investment. Costly litigation, negotiation, or both are the usual means of resolving Indian water disputes, and some cases can take decades to reach agreement. Some tribes request assistance from the federal government to pursue their water rights settlements, reminding concerned parties of the conflicting roles the federal government can assume on two or more sides of a judicial or administrative issue.

Law of the River

The Colorado River is managed and operated under numerous compacts, federal laws, court decisions and decrees, contracts, and regulatory guidelines collectively known as the "Law of the River." In 1922, the seven Colorado River basin states negotiated the Colorado River Compact, which divided the states into two basins—upper and lower—and apportioned 7.5 million acre-feet per year to each basin. The compact also referenced Mexico's right to the Colorado River. The Boulder Canyon Project Act of 1928 ratified the Compact and established California's apportionment at 4.4 million acre-feet per year. In 1944, the United States signed a water treaty in which it agreed to deliver an annual quantity of 1.5 million acre-feet of water annually to Mexico.

While compact negotiators estimated the flow of the river to be at least 17 million acre-feet per year, today's records indicate a flow of 15 million at Lee Ferry, just below Lake Powell. Consequently, the sum of the actual compact apportionments and the Mexican treaty exceed the flow of the river in most years.

Water Contracts

Water contracts are a way for an entity to obtain short-term or long-term access to water without having specific water rights to the water. State, federal, and many local water agencies have written contracts for delivery of water to other water purveyors or customers. Both the SWP and CVP have water rights that are subject to area of origin protections (see following section). The Operating Criteria and Plan (OCAP) provides detailed analysis of proposed CVP and SWP operations (see http://www.usbr.gov/mp/cvo/ocap.html). Both projects have written contracts to deliver water to water agencies that repay capital and operating costs. During some years, water deliveries are lower than the contract amounts shown below. (See the water portfolios for each region in Volume 3 Regional Reports).

- State Water Project—DWR has long-term water supply contracts for water service from the State Water Project with 29 local agencies for about 4.2 million acre-feet annually. The majority of the SWP goes to urban uses.

- Central Valley Project—The CVP supplies water to more than 250 long-term water contractors extending from Shasta County in the north to Kern County in the south. Collectively, the contracts call for a maximum annual delivery of 9.3 million acre-feet: 4.8 million acre-feet is classified as project water, and 4.5 million acre-feet is classified as water right settlement water.

Releases of water for environmental uses

Fish and Game Code Section 5937 provides protection to fisheries by requiring that the owner of any dam allow sufficient water to pass downstream to keep in good condition any fisheries planted or existing below the dam.

Water transfers

Every year, hundreds of water transfers (totaling hundreds of thousands of acre-feet) take place between water users for a wide variety of reasons. Some provide transport water on a short-term basis for drought-year emergency water supplies and some provide for long-term water supplies. Water transfers occur within districts and projects, and occur between regions. The State has facilitated transfers by purchasing and selling water through the Drought Water Bank. Short-term water transfers also include SWP supplemental water purchases and Central Valley Project Improvement Act and Environmental Water Account water acquisitions. See the Water Transfers narrative in Volume 2 Resource Management Strategies, for more detail.

Area of origin protections

During the years when California's two largest water projects, the CVP and SWP, were being planned and developed, area of origin provisions were added to the Water Code to protect local Northern California supplies from being depleted by the projects. County of origin statutes reserve water supplies for counties in which the water originates. The Delta Protection Act, enacted in 1959 (not to be confused with the Delta Protection Act of 1992), requires the SWP and the CVP to provide salinity control in the Delta and an adequate water supply for water users in the Delta. In 1984, additional area of origin protections were enacted to prohibit the export of groundwater from the combined Sacramento River and Delta basins, unless the export is in compliance with local groundwater plans.

Boxes

Figures

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[1] With Box 2-xx Description of California Hydrologic Regions and Overlay Areas

Box 2-xx Historical Perspective of Water Development in California

(From Water Education Foundation. *Layperson's Guide to California Water. 2003 Update*)

During the Gold Rush, California miners developed a system of claiming rights to take and transport water. These fortune seekers built the state's first hydraulic works—reservoirs and more than 4,000 miles of ditches and flumes—to sluice out the elusive shining metal. Water was harnessed and blasted into hillsides to dislodge gold in a practice called "hydraulic mining." Debris resulting from these mining practices washed down from the mountains and choked rivers, inundated native salmon spawning grounds, and caused serious problems with flooding for navigation and downstream water users.

As the gold began to diminish, farming grew in the Delta and Central Valley and so did the need for a dependable water supply. While many areas experienced too little water, others had too much. In the maze of swamps, sloughs and marshlands that form the Delta, farmers began building levees around periodically submerged islands and pumped water from behind them to reclaim the land for agriculture. Between 1860 and 1930, most of the Delta's 350 acres of freshwater marsh were leveed, drained, and planted.

Elsewhere, groundwater pumping enabled farms and cities to flourish despite the aridity of southern and central California. However, groundwater levels began to drop, which caused an increase in pumping costs. This pointed out the need for a more efficient distribution of the state's surface water supplies.

Groups of farmers banded together, and cooperatives and development companies formed to finance and construct water projects in the San Joaquin Valley and southern California. The inherent problems associated with placing control of such a vital, public resource in private hands brought a move toward increasing public control. The first irrigation district, Turlock Irrigation District, was formed under the Wright Irrigation District Act of 1887. The act evolved into the California Irrigation District Act of 1917 and paved the way for other types of water development and delivery districts, such as county water districts and special services districts. California's two major population centers, the Los Angeles and San Francisco Bay areas, recognized the need to augment local water supplies and were the first to develop faraway sources.

The federal government has long played a major role in development of the West's water resources. As early as 1875, the U.S. Army Corps of Engineers began work on the Sacramento and Feather rivers to improve navigation. In 1920, the U.S. Geological Survey proposed a comprehensive, statewide plan for conveyance and storage of California's water supplies. This plan served as the framework for an eventual State Water Plan, which later formed the basis for the federal Central Valley Project.

California's population doubled between 1940 and 1960. It appeared the state could not rely solely on federal or local sources to help meet future water needs. Water planners recognized the need for Delta improvement and for supplemental water to support growing southern California and prevent groundwater overdraft in the Central Valley. Additionally, the need for flood control on the Feather River was recognized, as was the San Joaquin Valley's need for an outlet for saline irrigation drainage for fields. After years of debate and study, the Porter-Burns Act and a $1.75 billion bond measure launched what was to become the State Water Project.

During the two decades following World War II, development of California's water was virtually unimpeded. But by the 1970s, environmental awareness had grown to an extent that environmental considerations came to be factored into the water supply equation. As a result of enactment of new laws, attention was focused on "instream use" of water to benefit fish and wildlife, recreation, water quality, and aesthetics—uses to which price tags cannot easily be attached. By 1990, these uses rivaled such traditional benefits as irrigation and navigation in importance. Such instream uses are recognized by the State constitution and Water Code as beneficial and must be considered in administrative decisions and in issuing water rights permits. Rising costs and the enactment of State and federal environmental legislation have resulted in few major water development projects being built since 1980.

Today hundreds of water utility districts supply Californians with water purchased by contract from the state or the federal government, bought wholesale from another water agency, or development with local resources. It is estimated that there are more than 3,700 public and private agencies in California dealing with some aspect of water supply, use, or treatment.

See Chronology in Reference Guide, Volume 4.

Box 2-xx Critical Conditions of Overdraft

In 1978, the Department of Water Resources was directed by the legislature to develop a definition of critical overdraft and to identify those basins in a critical condition of overdraft (Water Code §12924). DWR held public workshops around the State to obtain public and water managers' input on what the definition should include and which basins were critically overdrafted. Bulletin 118-80, *Ground Water Basins in California* was published in 1980 with the results of that local input. The definition of critical overdraft is:

> *A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts.*

No time is specified in the definition. Definition of the time frame is the responsibility of the local water managers, as is the definition of significant adverse impacts, which would be related to the local agency's management objectives.

Eleven basins were identified as being in a critical condition of overdraft. They are:

Pajaro Basin	Cuyama Valley Basin
Ventura Central Basin	Eastern San Joaquin County Basin
Chowchilla Basin	Madera Basin
Kings Basin	Kaweah Basin
Tulare Lake Basin	Tule Basin
Kern County Basin	

The task was not identified by the Legislature, nor was the funding for this update (2003) sufficient to consult with local water managers and fully re-evaluate the conditions of the 11 critically overdrafted basins. Funding and duration were not sufficient to evaluate additional basins with respect to conditions of critical overdraft.

(From *Bulletin 118 2003 Update*)

Box 2-xx Description of California's Hydrologic Regions and Overlay Areas

The Department of Water Resources subdivides the State into regions for planning purposes. The largest planning unit is the hydrologic region. California has 10 hydrologic regions corresponding to the State's major drainage basins. This water plan update includes two overlay areas also described here: the Sacramento – San Joaquin Delta and the Mountain Counties.

Hydrologic regions

North Coast. Klamath River and Lost River Basins, and all basins draining into the Pacific Ocean from the Oregon stateline southerly through the Russian River Basin.

San Francisco Bay. Basins draining into San Francisco, San Pablo, and Suisun Bays, and into Sacramento River downstream from Collinsville; western Contra Costa County; and basins directly tributary to the Pacific Ocean below the Russian River watershed to the southern boundary of the Pescadero Creek Basin.

Central Coast. Basins draining into the Pacific Ocean below the Pescadero Creek watershed to the southeastern boundary of Rincon Creek Basin in western Ventura County.

South Coast. Basins draining into the Pacific Ocean from the southeastern boundary of Rincon Creek Basin to the Mexican boundary.

Sacramento River. Basins draining into the Sacramento River system in the Central Valley (including the Pit River drainage), from the Oregon border south through the American River drainage basin.

San Joaquin River. Basins draining into the San Joaquin River system, from the Cosumnes River basin on the north through the southern boundary of the San Joaquin River watershed.

Tulare Lake. The closed drainage basin at the south end of the San Joaquin Valley, south of the San Joaquin River watershed, encompassing basins draining to Kern Lakebed, Tulare Lakebed, and Buena Vista Lakebed.

North Lahontan. Basins east of the Sierra Nevada crest, and west of the Nevada stateline, from the Oregon border south to the southern boundary of the Walker River watershed.

South Lahontan. The closed drainage basins east of the Sierra Nevada crest, south of the Walker River watershed, northeast of the Transverse Ranges, north of the Colorado River Region. The main basins are the Owens and the Mojave River Basins.

Colorado River. Basins south and east of the South Coast and South Lahontan regions; areas that drain into the Colorado River, the Salton Sea, and other closed basins north of the Mexican border.

Overlay Areas

Sacramento-San Joaquin Delta. The Legal Delta includes about 740,000 acres of tidally influenced land near the confluence of the Sacramento and San Joaquin rivers. While it occupies portions of the Sacramento, San Joaquin, and a small part of the San Francisco hydrologic regions, the Delta is described as an overlay area because of its common characteristics, environmental significance, and its important role in the State's water systems.

Mountain Counties. The Mountain Counties region includes the foothills and mountains of the western slope of the Sierra Nevada and a portion of the Cascade Range. The area includes the eastern portions of the Sacramento River and San Joaquin River hydrologic regions. This area shares common water and other resource issues and is the origin for much of the State's developed surface water supply.

Box 2-xx Recent Responses to Challenges

Programs and Plans
- Bay-Delta Program's Record of Decision
- California's Colorado River Water Use Plan
- Sacramento and San Joaquin River Basins Comprehensive Study

Water Bonds
- Proposition 204, November 1996, $995 million
- Proposition 13, March 2000, $1.97 billion
- Proposition 40, March 2002, $2.6 billion
- Proposition 50, November 2002, $3.4 billion

Task Forces and Advisory Panels
- Governor's Advisory Drought Planning Panel's Critical Water Shortage Contingency Plan
- Stormwater Management Quality Task Force Recommendations
- California Floodplain Management Task Force Recommendations
- Governor's Commission on Building for the 21st Century
- State Recycling Task Force Recommendations
- State Watershed Management Guidelines and Initiative

DWR Bulletin Updates
- California's Groundwater Update 2003 (Bulletin 118)
- Fish Passage Improvement (Bulletin 250-2003)
- Management of the California State Water Project (Bulletin 132-02)

Other Actions Required by Statutes
- Governor's Environmental Goals and Policy Report Update
- General Plan Guidelines Recommend New Water Element

Regional Initiatives
- See Volume 3 for regional initiatives that are under way

Box 2-xx Examples Of Ongoing Regional Water Planning Efforts (listed north to south)

- Klamath River Watershed Framework
- Sacramento Valley Water Management Program and Basin Wide Management Plan
- Regional Water Authority
- American River Forum
- Freeport Regional Water Project
- Bay Area Water Agencies Coalition and Regional Planning Program
- San Joaquin River Agreement
- Westside San Joaquin Valley Integrated Resource Planning Program
- San Joaquin Valley Water Coalition
- Kern County Water Agency Conjunctive Management Program
- Metropolitan Water District of Southern California Integrated Resources Planning Program
- Santa Ana River Watershed Program
- Colorado River Quantification Settlement Agreement (QSA)

Box 2-xx More Information on Integrated Planning

For more information on integrated resource planning see American Water Works Association's Guidelines for Implementing and Effective Integrated Resource Planning Process http://www.awwa.org/bookstore/product.cfm?id=90718

For more information on watershed management see Joint Task Force on California Watershed Management http://resources.ca.gov/watershedtaskforce/

Box 4-6

Box 2-xx Watershed Management

Most simply, a watershed is an area of land that drains to a single common point. For regional planning purposes in California, a watershed includes living (including the people who live and work in the watershed) and nonliving elements within a defined geographical area that is generally characterized by the flow of water. Watersheds provide a spatial scale that captures key ecological processes and functions that underpin natural resource conditions. The flow of water defining a watershed includes both surface water and groundwater as it moves through natural and constructed features, from higher elevations to lower elevations. Because of California's highly engineered water system, defining watershed boundaries is often based on hydrologic features but adjusted to accommodate water conveyance systems. In some cases watershed boundaries may be influenced by administrative boundaries as well, such as city limits. In addition, watersheds are dynamic and the make up of plants, animals, and other characteristics change over time.

In general watershed planning and management is a methodical and comprehensive mechanism for maintaining existing levels of water supply benefits while simultaneously enhancing environmental values within the watershed. To a lesser extent this approach can be used as a companion program to other planning processes that have the objective of meeting future water supply needs. Watershed management can be described more specifically as the process of evaluating, planning, managing, and organizing land and other resource use within a watershed while maintaining a sustainable ecosystem. Watershed management seeks to balance changes in community needs with evolving ecological conditions.

Watershed planning provides a chance to balance diverse goals and uses for environmental resources and to consider how cumulative actions may affect long-term sustainability of natural resources, public trust resources, and community characteristics. Watershed management as used in this water plan assumes that a prerequisite for any project is the sustained ability for the watershed to maintain the functions and processes that support the ecosystem of the watershed.

One of the reasons for the emergent interest in the watershed approach is engaging broad public participation. Most watershed management efforts in the State involve stewardship groups comprised of a broad cross section of interested parties. These groups provide for open and public discussion and decision making around watershed resources and promote a transparency for administrative, policy, and technical decisions about how watersheds and projects will be developed and managed. This ability for communities to have the capacity to engage in complex management decisions is a hallmark of current watershed efforts.

The State recently advanced two key initiatives to support watershed management. Pursuant to Water Code Section 30901 et seq., the State has convened the California Watershed Council, a public advisory body dedicated to providing recommendations on how the State can improve watershed management. The Resources Agency and the California Environmental Protection Agency have undertaken a strategic planning to improve the coordination of agencies in support of collaborative watershed management efforts. These efforts illustrate the level of commitment and the expectations for watershed management that has emerged at the State-agency level.

Box 2-xx New Laws Support Regional Water Planning and Management

- SB 672 and SB 1341 have increased the focus on integrated regional water planning in preparing the California Water Plan Update.
- The Integrated Regional Water Management Planning Act of 2002 (SB 1672) authorizes regional water management groups to prepare and adopt regional plans and requires DWR and other State agencies to include the status of regional water management planning in the set of criteria used to select projects for grant and loan programs.
- SB 1938 requires agencies seeking funding for groundwater projects to include a plan for coordinating with other agencies within a region.
- The governor and Legislature encouraged the regional approach by including regional representatives on the new California Bay-Delta Authority to oversee implementation of the Bay-Delta Program.
- The voters of California provided further support for regional solutions with approval of Proposition 50, which includes $500 million for integrated regional water management.
- SB 221 and SB 610 require greater coordination and more extensive data to be shared between water suppliers and local land use agencies for large development projects and plans.

These and other legislation passed since Bulletin 160-98 are described in Volume 4 Reference Guide.

Box 2-xx SB221, SB 610, and AB 901

SB 221 (Bus. and Prof. Code, § 11010 as amended; Gov. Code, § 65867.5 as amended; Gov. Code, §§ 66455.3 and 66473.7) prohibits approval of subdivisions consisting of more than 500 dwelling units unless there is verification of sufficient water supplies for the project from the applicable water supplier(s). This requirement also applies to increases of 10 percent or more of service connections for public water systems with less than 500 service connections. The law defines criteria for determining "sufficient water supply, such as using normal, single-dry, and multiple-dry year hydrology and identifying the amount of water that the supplier can reasonably rely on to meet existing and future planned uses. Rights to extract additional groundwater must be substantiated if used for the project.

SB 610 (Water Code, §§ 10631, 10656, 10910, 10911, 10912, and 10915 as amended; Pub. Resources Code, § 21151.9 as amended) and AB 901 (Water Code, §§10610.2 and 10631 as amended; Water Code § 10634) make changes to the Urban Water Management Planning Act to require additional information in Urban Water Management Plans (UWMP) if groundwater is identified as a source available to the supplier. Required information includes a copy of any groundwater management plan adopted by the supplier, proof that the developer or agency has rights to the groundwater, a copy of the adjudication order or decree for adjudicated basins, and if not adjudicated, whether the basin has been identified as being overdrafted or projected to be overdrafted in the most current DWR publication on the basin. If the basin is in overdraft, the UWMP must include current efforts to eliminate any long-term overdraft. A key provision in SB 610requires that any project subject to the California Environmental Quality Act supplied with water from a public water system be provided a water supply assessment, except as specified in the law. AB 901 requires the plan to include information relating to the quality of existing sources of water available to an urban water supplier over given periods and include the manner in which water quality affects water management strategies and supply reliability.

Formerly Box Drought 3-2

Box 2-xx Water 2025 (Federal) Principles, Realities, and Key Tools

Six principles to guide the Department of the Interior in addressing water problems:

- Recognize and respect state, tribal, and federal water rights, contracts, and interstate compacts or decrees of the U.S. Supreme Court that allocate the right to use water.
- Maintain and modernize existing water facilities so they will continue to provide water and power.
- Enhance water conservation, use efficiency, and resource monitoring to allow existing water supplies to be used more effectively.
- Use collaborative approaches and market based transfers to minimize conflicts.
- Improve water treatment technology, such as desalination, to help increase water supply.
- Existing water supply infrastructure can provide additional benefits for existing and emerging needs for water.

Five realities that drive water crises:

- Explosive population growth in areas of the West where water is already scarce
- Water shortages occur frequently in the West.
- Over-allocated watersheds can cause crisis and conflict.
- Water facilities are aging.
- Crisis management is not effective in dealing with water conflicts.

Four key tools to help manage scarce water resources:

- Conservation, efficiency, and markets
- Collaboration
- Improved technology
- Remove institutional barriers and increase interagency cooperation.

http://www.doi.gov/water2025/

Box 2-xx Recent Litigation in California Water Management

(See Volume 4 Reference Guide for more detailed explanation.)

Planning and Conservation League, Plumas County, and Santa Barbara Citizens Planning Association of Santa Barbara County v. Department of Water Resources and Central Coast Water Authority

The Planning and Conservation League filed a lawsuit on December 27, 1995, against the Department and Central Coast Water Authority, challenging the California Environmental Quality Act compliance for the Monterey Amendment. PCL amended the complaint February 13, 1996, alleging that the Department could not legally transfer the Kern Water Bank to Kern County Water Agency as part of the Monterey Amendment.

On July 18, 2002, the parties reached agreement on principles for settling the lawsuit. The final settlement agreement is being prepared for execution and submittal to the Superior Court for approval.

Coordinated Special Proceedings, State Water Resources Control Board Cases.

On March 15, 2000, SWRCB adopted Water Rights Decision 1641, which implemented certain water quality objectives in the May 1995 Water Quality Control Plan for the Sacramento-San Joaquin Bay Delta Estuary on a long-term basis. D-1641 did not implement the Delta outflow objectives in the 1995 Plan. Those objectives were to be addressed in a subsequent water rights hearing. D-1641 also approved the joint point of diversion which allowed interchangeable use of State Water Project (SWP) and Central Valley Project (CVP) pumping facilities under certain conditions. It also approved modification of the petition to modify the place and purpose of use in the CVP permits subject to condition. The trial commenced in August 2002. A decision is expected in 2003. The case is currently on appeal.

El Dorado Irrigation District v. State Water Resources Control Board

This litigation involves SWRCB Decision 1635, which approved the application by El Dorado Irrigation District to divert water for urban purposes based on the assignment of a "state filing." "State filings" are water rights filings made by the Department (or the Department of Finance prior to 1956) as part of a general plan for State water development. The litigation is expected to go to trial in 2003. This case is currently on appeal.

Tulare Lake Basin Water Storage District v. U.S.

In February 1998, plaintiffs Tulare, Kern, Wheeler Ridge-Maricopa Water Storage District, and others filed a claim in the U.S. Court of Federal Claims alleging that the federal government took plaintiffs' water without just compensation in violation of the Fifth Amendment of the U.S. Constitution.

On April 30, 2001, the Court issued a decision regarding liability, but not the amount of compensation, for the Constitutional takings claim. The trial to determine the amount of compensation to be paid was held in July 2002. The Court's final decision is expected in late 2003 or early 2004.

Box 2-xx Some Regulations Governing Water-related Resources Management

Regulations protecting water quality - Water quality is an important aspect of water resource management.

- Clean Water Act-National Pollutant Discharge Elimination System
- Porter-Cologne Water Quality Control Act
- Safe Drinking Water Act
- California Safe Drinking Water Act

Environmental laws and regulations - Several laws outline the state and federal obligations to protect and restore degraded habitats and species.

- Federal Endangered Species Act
- California Endangered Species Act
- Natural Community Conservation Planning
- Clean Water Act and River and Harbors Act (Dredge and Fill Permits)
- Water Code (Public Interest Terms and Conditions, etc.)
- Fish and Game Code (Streambed Alteration Agreements, Releases of Water for Fish, etc.)
- Migratory Bird Treaty Act
- Fish and Wildlife Coordination Act
- Central Valley Project Improvement Act
- State and Federal Wild and Scenic Rivers System
- National Wilderness Act

Regulating project planning, implementation and mitigation - Another set of environmental statutes compels governmental agencies and private individuals to document and consider the environmental consequences of their actions.

- National Environmental Policy Act
- California Environmental Quality Act

Regulations for water use efficiency - Water Code Section 275 directs the Department and SWRCB to "take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste or unreasonable use of water."

- Urban Water Management Planning Act
- Water Conservation in Landscaping Act
- Agricultural Water Management Planning Act
- Agricultural Water Suppliers Efficient Management Practices Act
- Agricultural Water Conservation and Management Act (AB3616) of 1992
- Water Recycling Act of 1991
- CALFED Water Use Efficiency Program

Local land use – Water planning is influenced by local land use requirements.

- Local General Plans and Specific Plans
- SB 221
- SB 610

Other regulations – Some other regulations that influence water resource management include:

- Federal Power Act
- Cloud Seeding Regulations
- State Water Resources Control Board decisions